

PATENT SPECIFICATION



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COMPLETE SPECIFICATION.

An Improved Process for the Treatment of Ores for the Recovery of Titanium, Tungsten and Tantalum.

I, ARNOLD WILLIAM GREGORY, a British subject, of 50, Crooms Hill, Greenwich, London, S.E. 10, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an improved process for the recovery of titanium, tungsten and tantalum and refers to the known process in which an ore is treated with an acid in order to resolve it into its constituents or to separate the ingredients either wholly or partially.

In the case of ores, such as ilmenite, a mineral containing a large percentage of ferrous titanate, and of wolframite, a mineral containing ferrous tungstate, and tantalite, a mineral containing ferrous tantalate, the direct treatment with any of the common acids, either concentrated or in the dilute state, is ineffective.

According to the present invention the ore is given a preliminary treatment under which the iron is reduced to the metallic state in a finely divided form at a comparatively low temperature. Practically the whole of the iron can then be dissolved out by the aid of a weak acid, such as 2% sulphuric acid.

The titanium, tungsten and tantalum residues respectively are obtained in a form in which they can be easily treated for recovery.

The finely powdered ore, ilmenite for example, is mixed with such a percentage of carbon as will reduce the iron present from the state of oxide to the metal and also with a quantity of a fusible alkali salt such as sodium carbonate. The mixture is then heated to a state of bright redness in a closed vessel to prevent access of air, or in a reducing or neutral atmosphere. The resulting mass, which

is pulverulent or lightly fritted together, may then be treated with 2% sulphuric acid. This removes practically the whole of the iron, ferrous sulphate being formed.

The residue contains nearly all the titanium and may be further treated for the recovery of titanium or for the production of titanium oxide by known means.

The aforesaid ores of tungsten and tantalum may be treated in an analogous manner with the resultant separation of iron and tungsten and iron and tantalum respectively.

The process is capable of application generally in the treatment of ores containing titanium, tungsten and tantalum where the iron may be separated from the main or valuable constituents by treatment with acids.

As an illustration of the practical application of the invention the following is given as applied to the treatment of ilmenite.

A sample of this mineral, which was found to contain approximately 50% of iron oxide and about 40% of titanium oxide, was mixed with powdered coal and soda ash in the following proportions:—

Ilmenite	-	100 parts,	
Powdered coal	-	20 parts,	
Soda ash	-	20 parts.	80

This was heated in a closed chamber to bright redness for at least one hour. It was then treated with enough 2% sulphuric acid to neutralise the soda and form, with the iron, ferrous sulphate, and a slight excess to render the liquid faintly acid. The whole was then raised to, and maintained at, the boiling point for one hour when practically all the iron was found in the solution and practically all the titanium in the residue.

[Price 1s.]

Price 3s. 6d.

Price 25s.

Whilst, as aforesaid, it has been found that acids so weak as 2% sulphuric are quite satisfactory for the purpose of extracting the iron, it will be understood
5 that the strength of the acid may be varied as desired.

I am aware that it has been proposed to heat ilmenite with charcoal, coal and the like, for the purpose of reducing the
10 iron, but in this case a temperature of about 1000° C. is needed, and moreover there is usually obtained only a partial reduction of the ore. Where an alkali such as sodium carbonate is used in con-
15 junction with the carbon, the temperature need not exceed 700° to 800° C., the reaction is almost complete after an hour's heating, and the titanium oxide eventually separated is in a form easily
20 attacked by strong sulphuric acid, the method usually used for the extraction of titanium oxide.

Having now particularly described and ascertained the nature of my said inven-

tion and in what manner the same is to be performed, I declare that what I claim is:— 25

1. A process for the treatment of ore with acid for the recovery of titanium, tungsten and tantalum, according to
30 which the ore in a finely divided form is mixed with carbon in a sufficient quantity to reduce the iron present from the state of oxide to the metal, together with a fusible alkali salt, the mixture is
35 heated to bright redness in a closed vessel or in a neutral or reducing atmosphere, and finally the mass is treated with a weak acid substantially as described.

2. The process for the treatment of ore
40 with acid in order to resolve it into its constituents or to separate the ingredients either wholly or partly, substantially as described.

Dated this 19th day of October, 1925. 45

J. E. EVANS-JACKSON & Co.,
Agents for the Applicant.

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